



(12)

**EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
15.05.1996 Bulletin 1996/20

(51) Int. Cl.<sup>6</sup>: **G02B 21/24**, **A61B 3/107**

(43) Date of publication A2:  
21.02.1996 Bulletin 1996/08

(21) Application number: 95109894.6

(22) Date of filing: 24.06.1995

(84) Designated Contracting States:  
DE ES FR GB IT

(30) Priority: 18.08.1994 US 292433  
15.03.1995 US 404244

**(71) Applicants:**  
**• Carl Zeiss**  
**D-89518 Heidenheim (Brenz) (DE)**  
**Designated Contracting States:**  
**DE ES FR IT**

- **CARL-ZEISS-STIFTUNG,  
HANDELND ALS CARL ZEISS  
D-89518 Heidenheim (Brenz) (DE):**  
Designated Contracting States:  
**GB**

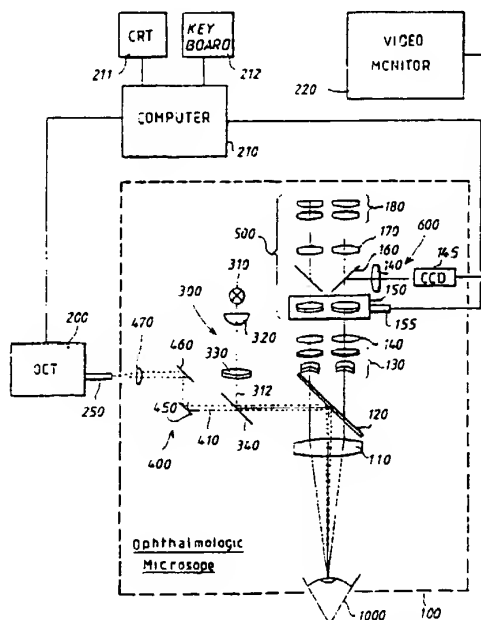
(72) Inventors:

- Wei, Jay  
Fremont, CA 94539 (US)
- Hellmuth, Thomas, Dr.  
D-73431 Aalen (DE).

**(54) Optical coherence tomography assisted surgical apparatus**

(57) Ophthalmologic surgical microscope which is combined internally with an optical coherence tomography ("OCT") apparatus wherein auto-focusing is provided by driving a motorized internal focusing lens of the ophthalmologic surgical microscope with a signal output from the OCT apparatus. An embodiment of the inventive ophthalmologic surgical microscope includes: (a) an optical coherence tomography ("OCT") apparatus; (b) a beamcombiner for internally coupling output from the OCT apparatus into the ophthalmologic surgical microscope; and (c) a motor for moving an internal focusing lens of the ophthalmologic surgical microscope in response to a signal from the OCT apparatus, whereby the ophthalmologic surgical microscope is auto-focused.

FIG. 1





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 95 10 9894

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO-A-92 19930 (MASSACHUSETTS INST TECHNOLOGY ; SWANSON ERIC A (US)) 12 November 1992 * page 14, paragraph 1 * * page 43, paragraph 2 - page 47, paragraph 1 *	1,5-8, 10-13, 15,18,22	G02B21/24 A61B3/107
A	US-A-4 931 630 (COHEN DONALD K ET AL) 5 June 1990 * column 2, line 46 - column 3, line 24; figures 1-5 *	1	
A	WO-A-93 16631 (PHOENIX LASER SYTEMS) 2 September 1993 * page 52, line 21 - page 55, line 2; figure 8 * * page 77, line 5 - page 80, line 5 * * page 39, line 18 - page 41, line 8 *	1,2,15, 22	
Y	OPTICS LETTERS, vol. 18, no. 21, 1 November 1993 WASHINGTON US, pages 1864-1866, SWANSON ET AL. 'In vivo retinal imaging by optical coherence tomography' * page 1866, left column; figures 1,2 *	9-13	TECHNICAL FIELDS SEARCHED (Int.Cl.6)  G02B A61B A61F
A		1,3-8, 15,22	
Y	PROCEEDINGS OF THE IEEE, vol. 80, no. 6, 1 June 1992 pages 838-859, XP 000311051 THOMPSON K P ET AL 'Therapeutic and diagnostic applisiation of lasers in ophthalmology' * figure 13 *	9-13	
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 11 March 1996	Examiner von Moers, F
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document</p> <p>T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &amp;: member of the same patent family, corresponding document</p>			

EPO FORM 1503 (12.92) (P04C01)



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 95 10 9894

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-4 795 250 (Y. NAKAMURA) 3 January 1989 * column 4, line 39 - line 53; figure 5 *	1,9	
A	APPLIED OPTICS, vol. 31, no. 31, 1 November 1992 pages 6637-6642, XP 000310747 HITZENBERGER C K 'MEASUREMENT OF CORNEAL THICKNESS BY LOW-COHERENCE INTERFEROMETRY' * page 6637, left column; figure 1 *	15,22	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 11 March 1996	Examiner von Moers, F
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.92 (P04C01)



European Patent  
Office

EP 95109894

### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.



### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-14:  
Optical coherence tomograph internally coupled to ophthalmologic surgical microscope.
2. Claims 15-22:  
Optical coherence tomograph combined with surgical laser apparatus.

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respects of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent  
Office

EP 95109894 - B -



**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-14: Optical coherence tomograph internally coupled to ophthalmologic surgical microscope.
2. Claims 15-22: Optical coherence tomograph combined with surgical laser apparatus.